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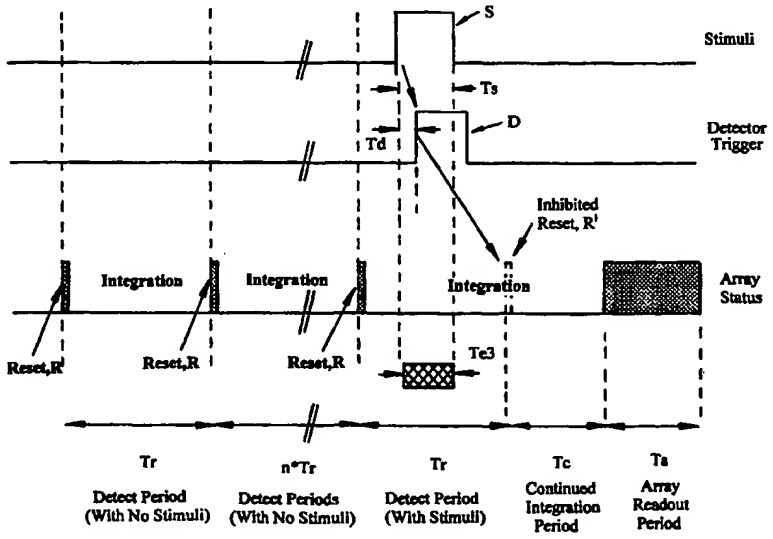
(81) Designated States: JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: IMAGE CAPTURE CONTROL



(57) Abstract

A method of operating a solid state image sensor (1) for the acquisition of an image generated by an asynchronous stimulus (S) is described in which the sensor is operated in conjuction with at least one detector (4) which detects the said asynchronous stimulus. The sensor is regularly reset so as to commence integration from a reset state of the sensor each time a period Tr has elapsed. The output of the detector(s) prior to each reset (R) is used to determine whether that reset is inhibited or not, whereby the likelihood of the stimulus being corrupted is prevented, or at least substantially reduced. A method is also proposed in which a portion of the sensor array is itself used as the detector (4) for detecting the asynchronous stimulus. A solid state image sensor incorporating a reset inhibition control function for carrying out the described method is also claimed.

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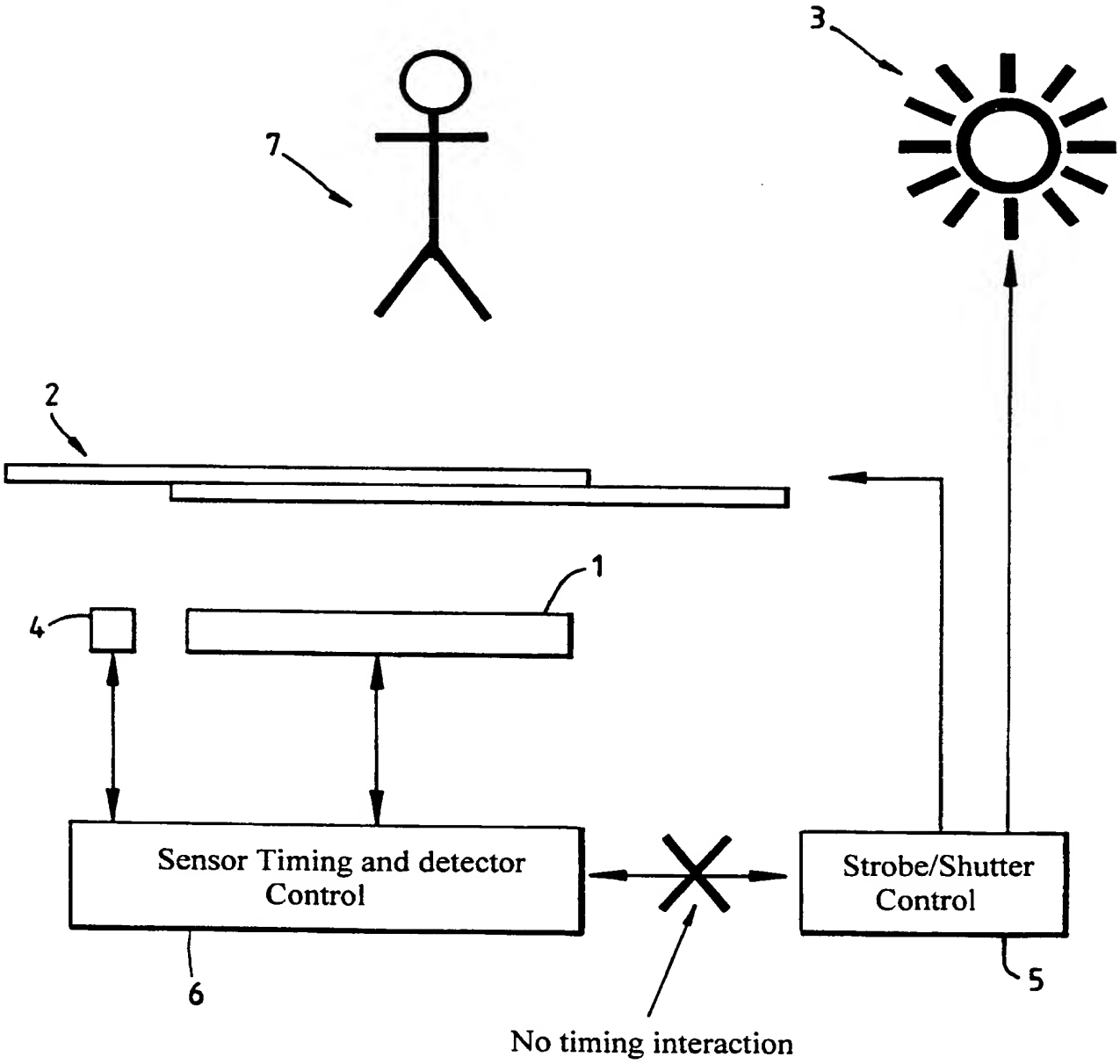
3
7
2
1
4
Sensor Timing and detector Control
Strobe/Shutter Control
6
5
No timing interaction

Fig. 1

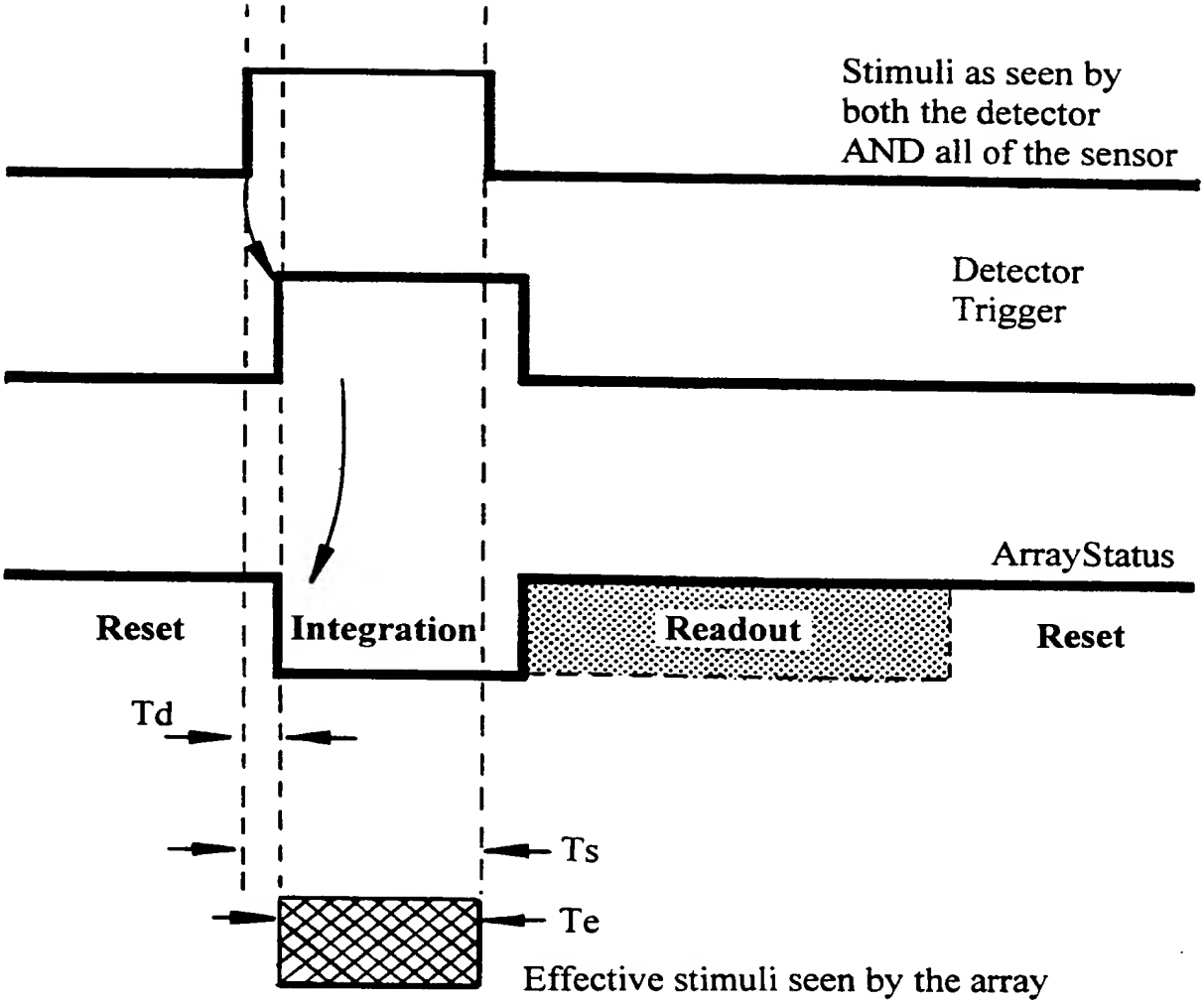
Stimuli as seen by
both the detector
AND all of the sensor
Detector
Trigger
ArrayStatus
Reset
Integration
Readout
Reset
Td
Ts
Te
Effective stimuli seen by the array

Fig. 2a

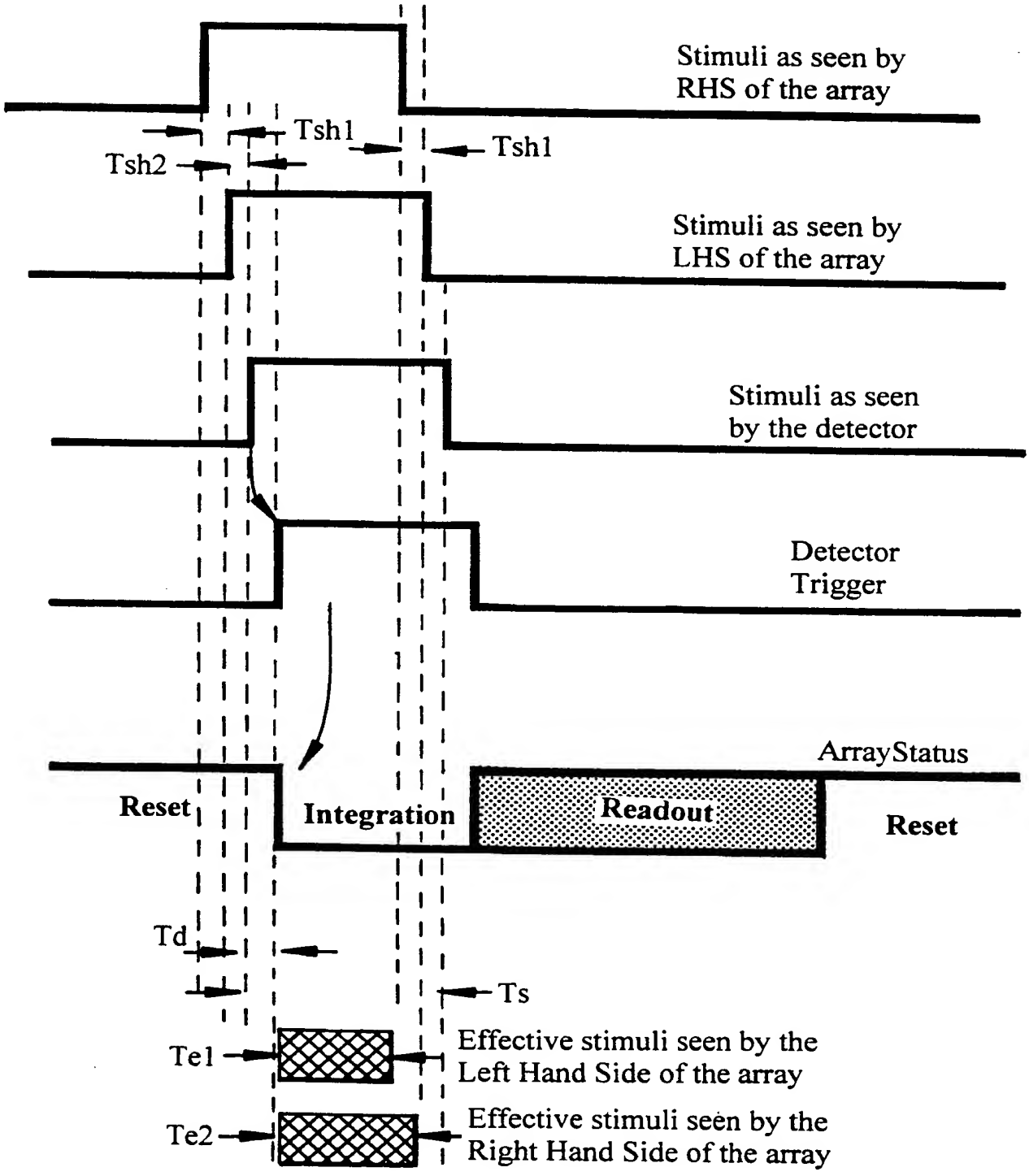
Stimuli as seen by
RHS of the array
Tsh1
Tsh2
Tsh1
Stimuli as seen by
LHS of the array
Stimuli as seen
by the detector
Detector
Trigger
ArrayStatus
Reset
Integration
Readout
Reset
Td
Ts
Te1
Effective stimuli seen by the
Left Hand Side of the array
Te2
Effective stimuli seen by the
Right Hand Side of the array

Fig. 2b

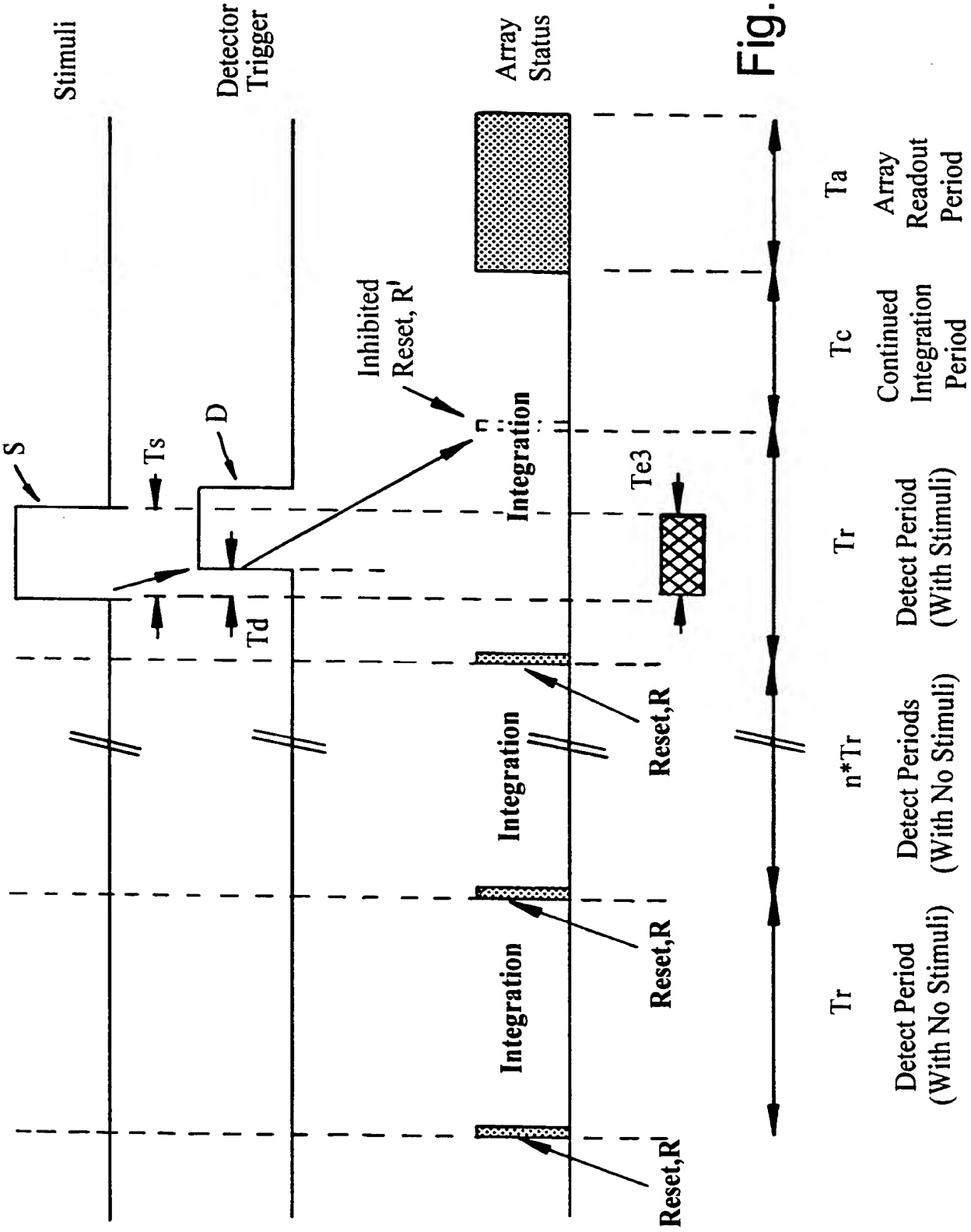
Stimuli
Detector Trigger
Array Status
S
Ts
D
Td
Inhibited Reset, R'
n
Integration
Te3
Integration
Reset,R
Integration
Reset,R
Reset,R'
Tr
Detect Period (With No Stimuli)
n*Tr
Detect Periods (With No Stimuli)
Tr
Detect Period (With Stimuli)
Tc
Continued Integration Period
Ta
Array Readout Period

Fig. 3a

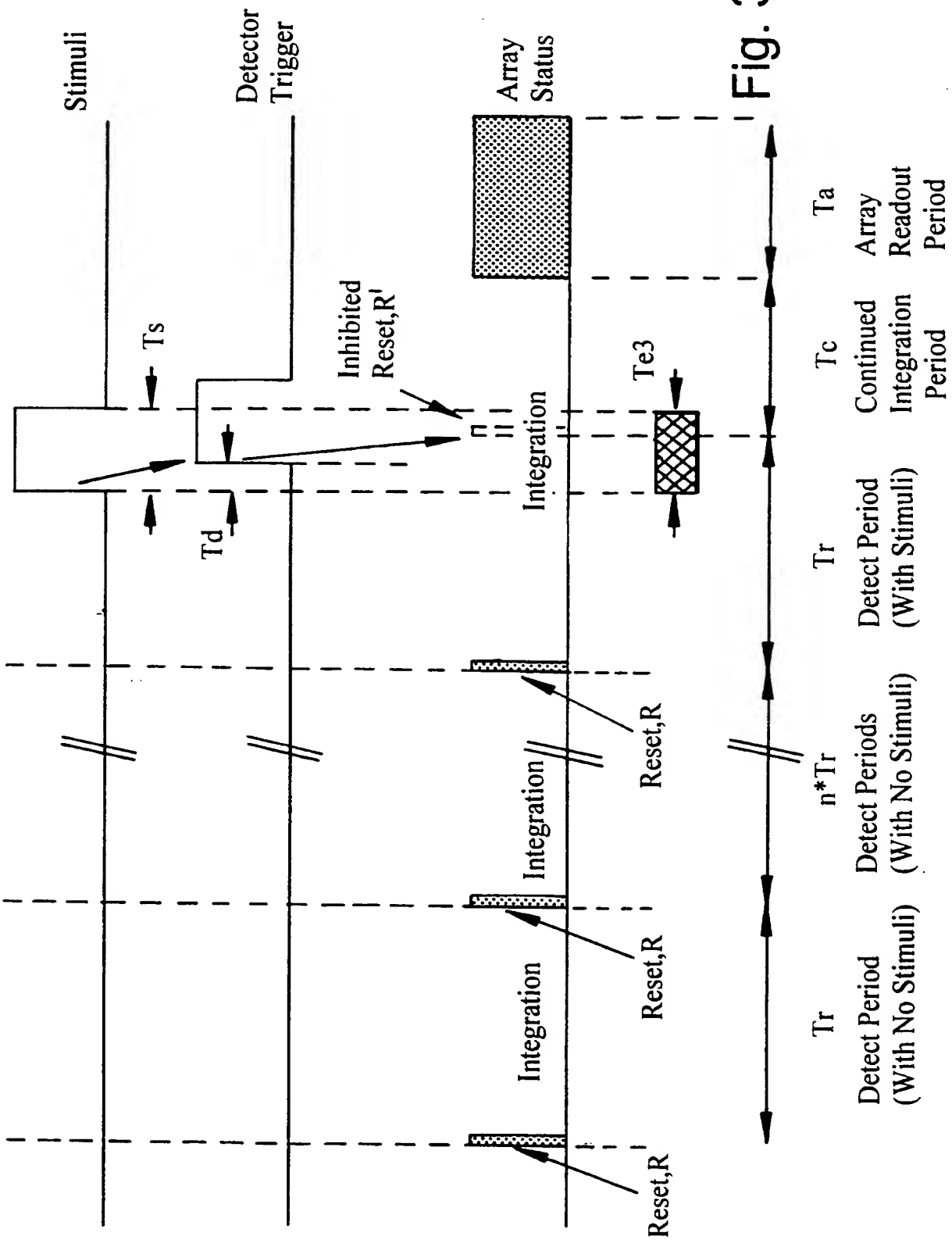
Stimuli
Detector Trigger
Array Status
Ts
Td
Inhibited Reset,R'
Integration
Te3
Reset,R
Integration
Reset,R
Integration
Reset,R
Tr
Detect Period (With No Stimuli)
n*Tr
Detect Periods (With No Stimuli)
Tr
Detect Period (With Stimuli)
Tc
Continued Integration Period
Ta
Array Readout Period

Fig. 3b

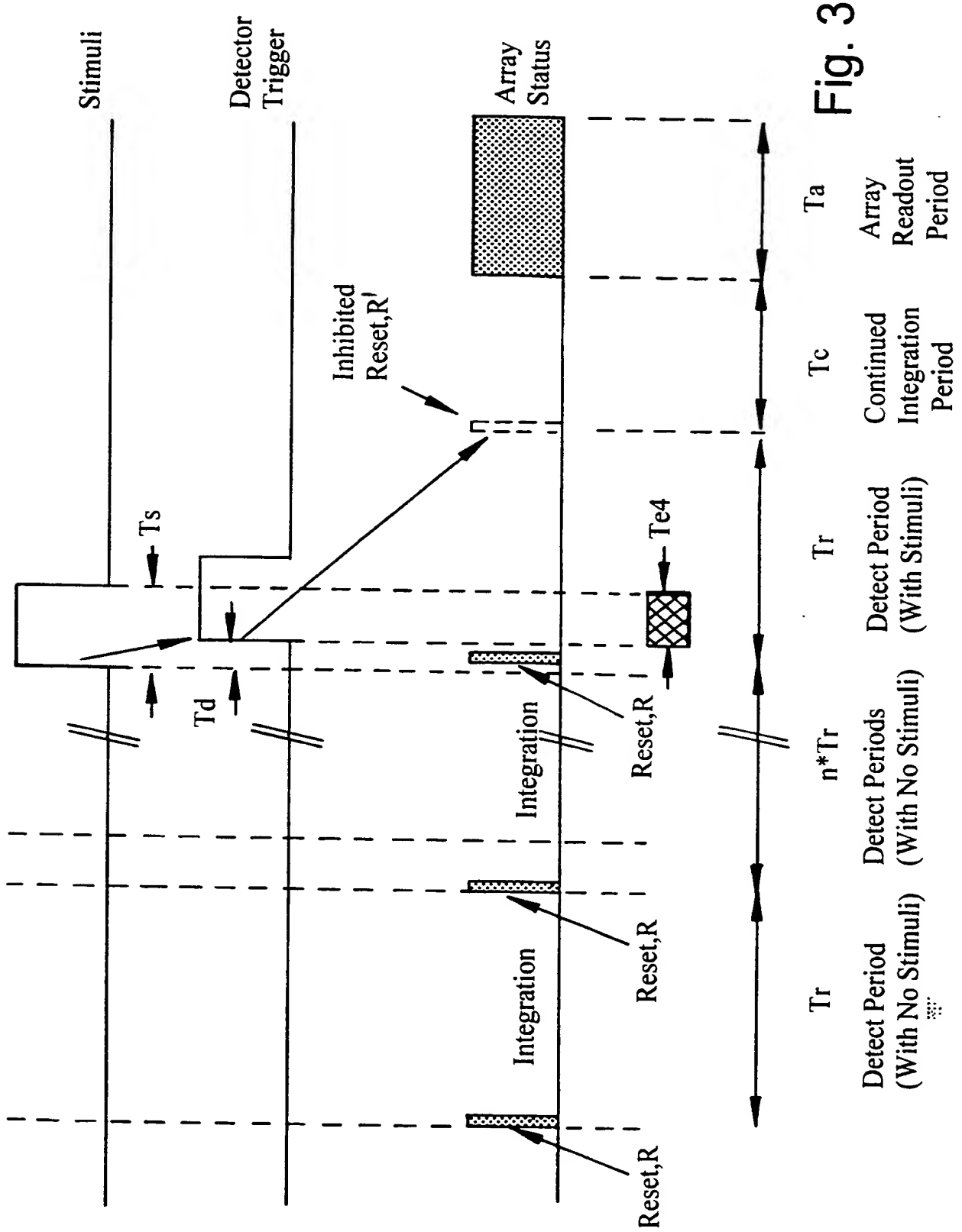
Stimuli
Detector Trigger
Array Status
Inhibited Reset,R'
Ts
Td
Te4
Integration
Reset,R
Integration
Reset,R
Integration
Reset,R
Ta
Array Readout Period
Tc
Continued Integration Period
Tr
Detect Period (With Stimuli)
n*Tr
Detect Periods (With No Stimuli)
Tr
Detect Period (With No Stimuli)

Fig. 3c

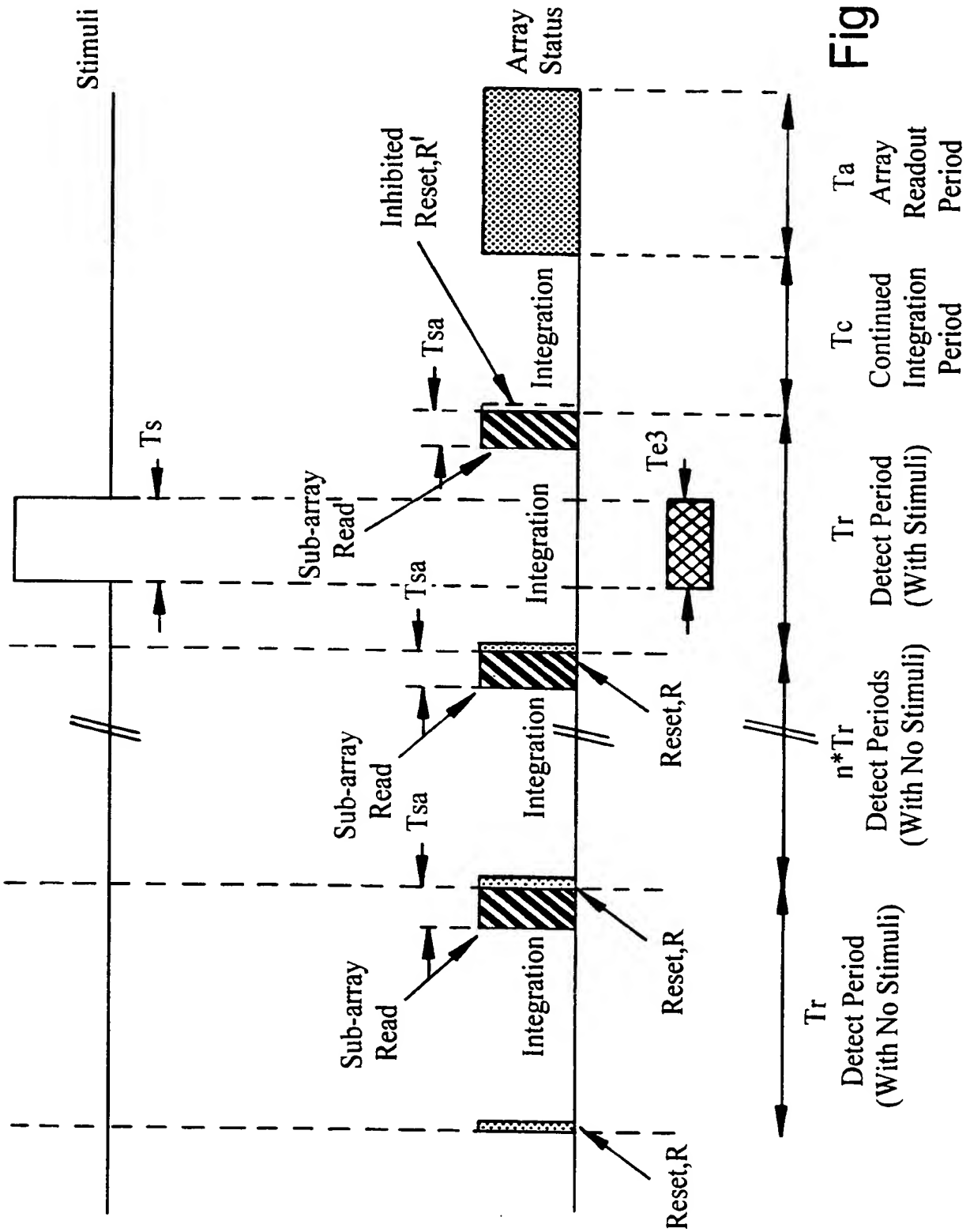
Stimuli
Array Status
Inhibited Reset,R'
Tsa
Integration
Ts
Sub-array Read'
Te3
Tsa
Integration
Sub-array Read
Tsa
Integration
Reset,R
Sub-array Read
Integration
Reset,R
Reset,R
Tc Continued Integration Period
Ta Array Readout Period
Tr Detect Period (With Stimuli)
n*Tr Detect Periods (With No Stimuli)
Tr Detect Period (With No Stimuli)

Fig. 4

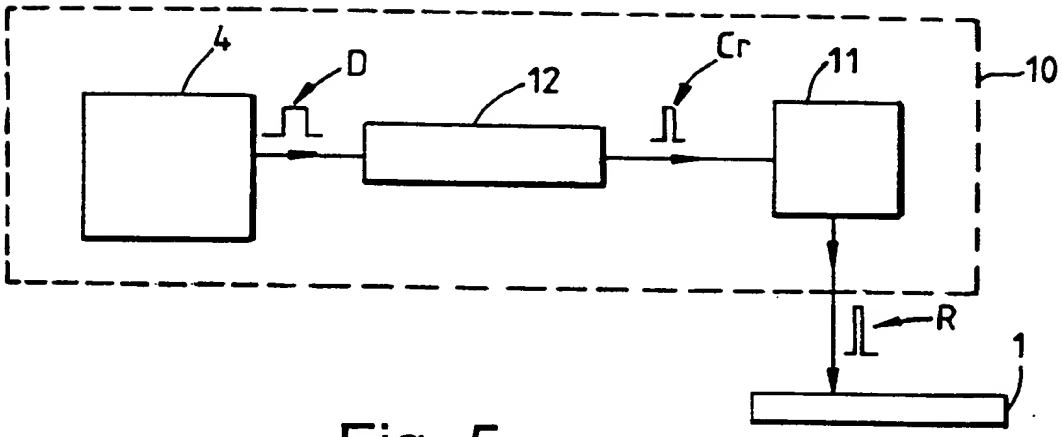

Fig. 5

INTERNATIONAL SEARCH REPORT

national Application No
PCT/GB 99/01365

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04N3/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 422 670 A (FUKUI HIROSHI) 6 June 1995 (1995-06-06)	1,2,5-8
A	column 1, line 49 - column 2, line 42; figures 2,3C	3

[ ] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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27 July 1999	02/08/1999

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INTERNATIONAL SEARCH REPORT

Information on patent family members

national Application No
PCT/GB 99/01365

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5422670 A	06-06-1995	JP 6125502 A	06-05-1994

F. .ENT COOPERATION TREA

From the INTERNATIONAL BUREAU

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International application No. PCT/GB99/01365	**Applicant's or agent's file reference** SK/P09150PC
International filing date (day/month/year) 30 April 1999 (30.04.99)	**Priority date** (day/month/year) 01 May 1998 (01.05.98)
Applicant HURWITZ, Jonathan, Ephriam, David et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

06 November 1999 (06.11.99)

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REPLACED BY
ART 34 AMDT

CLAIMS

1. A method of operating a solid state image sensor (1) for the acquisition of an image generated by an asynchronous stimulus (S), wherein said image sensor is operated in conjunction with at least one detector (4) which, directly or indirectly, detects the said asynchronous stimulus, said image sensor is regularly reset so as to commence integration from a reset state of the sensor each time a predetermined period (Tr) has elapsed, and an output from said at least one detector prior to each reset (R) is used to determine whether that reset is inhibited or not.

2. A method according to claim 1 wherein the detector outputs a detection signal (D) when said asynchronous stimulus (S) is detected, and said detection signal (D) is used to trigger a reset inhibition control signal (Cr) for inhibiting the subsequent reset signal (R').

3. A method of using a solid state image sensor (1), comprising an array of sensing cells, for the acquisition of an image generated by an asynchronous stimulus (S), wherein said image sensor is regularly reset so as to commence integrating from a reset state of the sensor each time a predetermined period (Tr) has elapsed, and wherein a portion of the array of the sensor (1) is read prior to each said reset (R) and the value of this read is used to determine whether the subsequent reset (R') should be inhibited or not.

4. A method according to claim 3, wherein said portion of the array read prior to each reset (R) comprises a plurality of sensing cells which are spatially distributed throughout the array of sensing cells.

5. Image capture control apparatus suitable for use with a solid state image sensor (1) for the acquisition of an image presented to the sensor in response to an asynchronous stimulus (S), said apparatus comprising at least one detector means (4) formed and arranged for detecting, in use of the apparatus, directly or indirectly, a said asynchronous stimulus (S), and reset inhibition control signal output means (12) formed and arranged for generating a reset inhibition control signal in response to detection of said asynchronous stimulus (S) and supplying it, directly or indirectly, in use of the apparatus, to a reset signal generating means (11) operatively coupled to said solid state image sensor, so as to inhibit the application of at least one subsequent reset signal (R') to the sensor.

6. Image capture control apparatus according to claim 5, wherein said at least one detector means (4) and said reset inhibition control signal output means (12) are provided in a single device.

7. Image capture control apparatus according to claim 5 or claim 6, wherein said reset inhibition control signal output means (12) and said reset signal generating means (11) are provided together in a single device.

8. A camera having a solid state image sensor, wherein is provided image capture control apparatus according to claim 5, claim 6 or claim 7.

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REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* SK/P09150PC

Box No. I TITLE OF INVENTION

IMAGE CAPTURE CONTROL

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

VLSI Vision Limited
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Edinburgh, EH12 7BF
United Kingdom

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(that is, country)* of nationality: UNITED KINGDOM (GB)

State *(that is, country)* of residence: UNITED KINGDOM (GB)

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HURWITZ Jonathan Ephriam David
17 (3Fl) Gladstone Terrace
Edinburgh
EH9 1LS
United Kingdom

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is,country)* of nationality: UNITED KINGDOM (GB)

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DENYER, Peter Brian
5 Albert Terrace
Edinburgh
EH10 5EA
United Kingdom

This person is:
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- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

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State *(that is, country)* of residence: UNITED KINGDOM (GB)

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This person is:
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- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

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- ☐ ZA South Africa .....
- ☐ .....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)*

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 1 May 1998	9809482.4	United Kingdom		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): (1)

* *Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):* ISA /

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*

Date *(day/month/year)* Number Country *(or regional Office)*

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets:**

request	:	4
description (excluding sequence listing part)	:	10
claims	:	2
abstract	:	1
drawings	:	8
sequence listing part of description	:	0
Total number of sheets	:	25

This international application is **accompanied by** the item(s) marked below:

1. ☒ fee calculation sheet
2. ☒ separate signed power of attorney (to follow)
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☒ other *(specify)*: PF 23/77

Figure of the drawings which should accompany the abstract: Fig. 3a

Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

KERR, Sheila Agnes Fife

For receiving Office use only

1. Date of actual receipt of the purported international application:
2. Drawings: ☐ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA /
6. ☐ Transmittal of search copy delayed until search fee is paid.

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET
Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's file reference: SK/P09150PC

Applicant: VLSI Vision Limited

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE . . . . . £55.00 [T]

2. SEARCH FEE . . . . . £812.00 [S]

International search to be carried out by _____
(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee
The international application contains 25 sheets.

first 30 sheets . . . . . £285.00 [b1]

_____ (remaining sheets) x _____ (additional amount) = - [b2]

Add amounts entered at b1 and b2 and enter total at B . . . . £285.00 [B]

Designation Fees
The international application contains 3 designations.

3 (number of designation fees payable *(maximum 10)*) x £65 (amount of designation fee) = £195.00 [D]

Add amounts entered at B and D and enter total at I . . . . . £480.00 [I]

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT *(if applicable)* . . . . . £22.00 [P]

5. TOTAL FEES PAYABLE . . . . . £1369.00 TOTAL
Add amounts entered at T, S, I and P, and enter total in the TOTAL box

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☐ authorization to charge deposit account (see below)	☐ bank draft	☐ coupons
☒ cheque	☐ cash	☐ other *(specify):*
☐ postal money order	☐ revenue stamps	

DEPOSIT ACCOUNT AUTHORIZATION *(this mode of payment may not be available at all receiving Offices)*

The RO/ _____ ☐ is hereby authorized to charge the total fees indicated above to my deposit account.

☐ *(this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit)* is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

Deposit Account No. _____ Date *(day/month/year)* _____ Signature _____

See Notes to the fee calculation sheet

Patents Form 23/77

Patents Act 1977
Rules 6, 52, 119

The Patent Office

23/77

Request for a certificate of the Comptroller or a certified or uncertified copy from a file or the register

(See the notes on the back of this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference — JTS/P08253GB

2. Patent application or patent number(s) *(see notes (c) & (d))* — GB9809482.4

3. Full name of the or of each patent applicant or proprietor *(if known)* — VLSI Vision Limited

4. What do you want a copy of? *(see note (f))* — Application as filed

5. How many copies do you need? — One

6. State the type of certificate you want *(see note (g))* and if it is needed to support applications made outside the United Kingdom, list the countries concerned *(see notes (j) & (k))* — Certified with signature and seal. (The document attached to the certificate comprises a true and accurate copy of the specification as originally filed in support of the above application. The document is required in connectio with an Application in/under PCT

7. Name, address and postcode of the or of each person making this request *(see note (b))*

Cruikshank & Fairweather
19 Royal Exchange Square
Glasgow
G1 3AE
Scotland, UK

8. Name, address and postcode of the or of each person certificates or copies should be sent to (if different from that given in part 6 above) *(see note (i))*

9. Signature — Date

(Agents)

10. Name and daytime telephone number of person to contact in the United Kingdom — S. A. F. Kerr - 0131.225.4500

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
SK/LD/P09150PC		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB99/01365	30/04/1999	01/05/1998
International Patent Classification (IPC) or national classification and IPC H04N3/15		
Applicant VLSI Vision Limited et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
06/11/1999	02.06.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer D/L FUENTE DEL .., P Telephone No. +49 89 2399 8608

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/01365

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-10 as originally filed

Claims, No.:

1-13 as received on 10/05/2000 with letter of 10/05/2000

Drawings, sheets:

1/8-8/8 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Ad section VIII:

1. Independent claim 1:

a. The claim fails to properly define (Article 6 PCT) the timings of the different temporal events involved in the definition of the subject matter.

b. The logical condition defined in the passage "in that if said output represents the detection of said asynchronous stimulus then the reset is inhibited" is not clear (Article 6 PCT) as the output of said detector always "represents the detection of said asynchronous stimulus". According to the teachings of the description, it appears that the reset is inhibited if at the time of providing a further reset pulse, the asynchronous stimulus has been detected (as being active or present) in said predetermined period.

2. Independent claim 7:

a. In addition to clarity objection (Article 6 PCT) as raised against claim 1 in paragraph 1.a which applies *mutatis mutandis* to claim 7, this claim does not define that the "image sensor is regularly reset so as to commence integration from a reset state of the sensor each time a predetermined period has elapsed" which is a feature considered as essential (Article 6 PCT) for carrying out the alleged invention.

Ad section V:

Reference is made to document D1: US-A-5 422 670

1. Independent claims:

a. Notwithstanding the clarity objections raised under section VIII of the present report and as far as claims 1 and 7 require clarifications by deriving the necessary clarifying teachings from the description, the following conclusions are drawn.

b. The application relates to the general field of solid state imaging and in particular to the methods (independent claims 1 and 3) for controlling the operation of such sensor as well as the corresponding apparatus (claims 7 and 13).

c. The closest prior art cited in the international search report is considered to be US-A-5 422 670. This document discloses a solid state imager device for imaging moving objects at high speed using a solid state sensor having an electronic shutter function. In this system, a position detector detecting an object to be imaged issues a trigger pulse which in turn generates a shutter pulse. Then, the

continuous supply of reset pulses to the sensor is interrupted and only at this stage the sensor starts integrating charges. Therefore, no charges are stored in the sensor during the charge draining period i.e. when the reset pulses are issued.

d. In contrast present application describes and claims (although improperly -Art-6 PCT-see section VIII) a method in which the sensor is periodically reset and starts integrating immediately after the occurrence of a reset pulse. If the detector (any detector in claim 1, a detector integrated into the sensor in claim 3) detects the presence of a asynchronous stimulus in a period beginning after the occurrence of the last reset pulse and ending just before issuing a reset pulse, said reset pulse is not generated and the sensor continues integrating as long as the asynchronous stimulus is detected. This is a different teaching than that of document D1, as, in D1, the detection of a the presence of an object in the field (this being similar to the "asynchronous stimulus") triggers a shutter pulse which in turn determines a predetermined integration period, e..g. 9 horizontal periods as can be seen in figure 3d of D1. The subject matter of the independent method claims is therefore new (Article 33(2) PCT) over D1.

e. In addition, it is to be noted that the claimed method has a provision for starting an integration just after each reset pulse is issued. This allows even the smaller events linked to the asynchronous stimulus to be "viewed" by the sensor. This cannot be achieved by the sensor of D1 in which the detection triggers the integration as, due to inherent delays, extremely short events will not be imaged. It is therefore considered that the subject matter of the independent method claims also involves an inventive step (Article 33(3) PCT).

f. Similar considerations apply to the corresponding apparatus independent claims 7 and 13.

2. Dependent claims:

a. The claims dependent on the independent claims define preferred embodiments of the alleged invention which are neither described in nor derivable from the cited documents.

Ad section VII:

a. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this

document identified therein (Rule 5.1 (a) (i) (ii)).

b. Independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in a preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in a characterising part (Rule 6.3(b)(ii) PCT).

CLAIMS

1. A method of operating a solid state image sensor (1) for the acquisition of an image presented to the sensor in response to an asynchronous stimulus (S), wherein said image sensor is operated in conjunction with at least one detector (4) which, directly or indirectly, detects the said asynchronous stimulus, said image sensor is regularly reset so as to commence integration from a reset state of the sensor each time a predetermined period (Tr) has elapsed, and an output from said at least one detector prior to each reset (R) determines whether that reset is inhibited or not in that if said output represents the detection of said asynchronous stimulus then said reset is inhibited.

2. A method according to claim 1 wherein the detector outputs a detection signal (D) when said asynchronous stimulus (S) is detected, and said detection signal (D) is used to trigger a reset inhibition control signal (Cr) for inhibiting a subsequent reset signal (R') to the sensor.

3. A method of using a solid state image sensor (1). comprising an array of sensing cells, for the acquisition of an image presented to the sensor in response to an asynchronous stimulus (S), wherein said image sensor is regularly reset so as to commence integrating from a reset state of the sensor each time a predetermined period (Tr) has elapsed, and wherein a portion of the array of the sensor (1) is read prior to each said reset (R) and the value of this read is used to determine whether a subsequent reset (R') signal to the sensor should be inhibited or not in that if said value indicates the occurrence of an asynchronous stimulus then said subsequent reset signal (R') is inhibited.

4. A method according to claim 3, wherein said portion of the array read prior to each reset (R) comprises a plurality of sensing cells which are spatially distributed throughout the

array of sensing cells.

5. A method according to any of claims 1 to 4 wherein the asynchronous stimulus is the opening of a camera shutter.

6. A method according to any of claims 1 to 4 wherein the asynchronous stimulus is a flash of light from a lighting strobe.

7. Image capture control apparatus suitable for use with a solid state image sensor (1) for the acquisition of an image presented to the sensor in response to an asynchronous stimulus (S), said apparatus comprising at least one detector means (4) formed and arranged for detecting, in use of the apparatus, directly or indirectly, a said asynchronous stimulus (S), and reset inhibition control signal output means (12) formed and arranged for generating a reset inhibition control signal in response to detection of said asynchronous stimulus (S) and supplying it, directly or indirectly, in use of the apparatus, to a reset signal generating means (11) operatively coupled to said solid state image sensor, so as to inhibit the application of at least one subsequent reset signal (R') to the sensor.

8. Image capture control apparatus according to claim 5, wherein said at least one detector means (4) and said reset inhibition control signal output means (12) are provided in a single device.

9. Image capture control apparatus according to claim 5 or claim 6, wherein said reset inhibition control signal output means (12) and said reset signal generating means (11) are provided together in a single device.

10. Image capture control apparatus according to any of claims 7 to 9 wherein the detector is formed and arranged for detecting the opening of a camera shutter.

AMENDED SHEET

11. Image capture control apparatus according to any of claims 7 to 9 wherein the detector is formed and arranged for detecting a flash of light from a lighting strobe.

12. A camera having a solid state image sensor, wherein is provided image capture control apparatus according to any of claims 7 to 11.

13. Image capture control apparatus suitable for use with a solid state image sensor (1) for the acquisition of an image presented to the sensor in response to an asynchronous stimulus (S), said apparatus comprising at least one detector means (4) formed and arranged for detecting, in use of the apparatus, directly or indirectly, a said asynchronous stimulus (S), and reset signal generating means (11) operatively coupled to said solid state image sensor for regularly resetting the image sensor, in use of the apparatus, so that the sensor commences integrating from a reset state thereof each time a predetermined period (Tr) has elapsed, reset inhibition control signal output means (12) formed and arranged for generating a reset inhibition control signal in response to detection of said asynchronous stimulus (S) and supplying it, directly or indirectly, in use of the apparatus, to said reset signal generating means, so as to inhibit the application of at least one subsequent reset signal (R') to the sensor.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
SK/P09150PC		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/GB 99/ 01365	30/04/1999	01/05/1998
Applicant		
VLSI Vision Limited et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

[ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

[ ] contained in the international application in written form.

[ ] filed together with the international application in computer readable form.

[ ] furnished subsequently to this Authority in written form.

[ ] furnished subsequently to this Authority in computer readble form.

[ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

[X] the text is approved as submitted by the applicant.

[ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

[X] the text is approved as submitted by the applicant.

[ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 3A

[X] as suggested by the applicant.

[ ] None of the figures.

[ ] because the applicant failed to suggest a figure.

[ ] because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 99/01365

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04N3/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 422 670 A (FUKUI HIROSHI) 6 June 1995 (1995-06-06)	1,2,5-8
A	column 1, line 49 - column 2, line 42; figures 2,3C	3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 July 1999	02/08/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Paepe, W

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 99/01365

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5422670 A	06-06-1995	JP 6125502 A	06-05-1994